

WHAT IS CLAIMED IS:

1. A method for moving a main chuck on which first objects are set in X, Y, Z, and θ directions to align the first objects with second objects arranged above the first objects, the method comprising:

(a) photographing the second objects through second photographing means to obtain second photographed images;

(b) displaying second virtual data images in a second image data area on a monitor screen of a display device on the basis of the second photographed images of the second objects;

(c) allowing an optical axis of the second photographing means to match an optical axis of first movable photographing means to obtain a reference position of the main chuck;

(d) moving the main chuck to align the first objects with the first photographing means and then photographing the first objects through the first photographing means to obtain first photographed images;

(e) displaying first virtual data images of the first photographed images in a first image data area on the monitor screen of the display device on the basis of design data of the first objects;

(f) relatively moving the first virtual data images and the second virtual data images on the

09586287.10001

monitor screen to superimpose both the virtual data images on each other; and

(g) determining a position where both the virtual data images are most fitly superimposed on each other as an alignment position of the first and second objects.

2. The method according to claim 1, wherein the second photographing means is provided for the main chuck.

3. The method according to claim 1, wherein the first objects are a plurality of electrode pads formed on an object to be inspected and the second objects are a plurality of contactors to be electrically brought into contact with the electrode pads.

4. The method according to claim 3, wherein in (b), the second virtual data images of the contactors are displayed with a color having a uniform density,

in (d), the electrode pads to be photographed by the first photographing means are reference electrodes for alignment among the plurality of electrode pads formed on the object to be inspected,

in (e), the first virtual data images of the electrode pads are displayed with dark and light colors, and

in (f), a position where an image density is most changed due to the superimposition of the first virtual

09986287-110004

5 5. A method for aligning a plurality of electrode pads arranged on an object to be inspected with a plurality of contacts formed on a probe card, the method comprising:

(b) displaying first virtual data images
corresponding to the predetermined electrode pads in a
first image data area on a monitor screen of a display
device on the basis of the first photographed images
and design data of the predetermined electrode pads,

(c) photographing the contactors through second photographing means to obtain second photographed images;

(d) displaying second virtual data images of the
25 contactors corresponding to the second photographed
images in a second image data area on the monitor
screen of the display device,

the second virtual data images being colored and the color denoting either of a color having a distributed density and a color having a uniform density;

5 (e) relatively moving the first virtual data images and the second virtual data images on the monitor screen to superimpose both the virtual data images on each other and then measuring the luminance of each portion where both the virtual data images are
10 superimposed on each other;

(f) detecting a superimposing state of the first virtual data image and the second virtual data image on the basis of the luminance measured in the (e);

(g) detecting a distance relatively traveled by
15 both the virtual data images until the superimposition of the first virtual data images and the second virtual data images is set to a predetermined state according to (f); and

(h) relatively moving the electrode pads and the
20 contactors on the basis of the traveled distance to align the pads with the contactors.

6. The method according to claim 5, wherein in (e), the luminance to be measured is a change in luminance.

25 7. The method according to claim 5, wherein in (f), the superimposing state of the first virtual data images and second virtual data images is detected on

the basis of a comparison of the measured luminance with a predetermined luminance value.

8. The method according to claim 5, wherein in (f), the superimposing state of the first virtual data images and the second virtual data images is grasped on the basis of a detection result indicating that the measured luminance denotes one of a maximum value and a minimum value.

9. The method according to claim 5, wherein in (d), each second virtual data image formed in the second image data area is one of an image obtained by enlarging a photographed image of each contactor and an image obtained by reducing the photographed image.

10. The method according to claim 5, wherein the predetermined electrode pads in (a) are all of the electrode pads on the object to be inspected, and

the contactors in (c) are the contactors corresponding to all of the electrode pads.

11. The method according to claim 5, wherein the predetermined electrode pads among the electrode pads in (a) are reference electrodes for alignment.

12. A method for detecting a superimposing state of first objects and second objects arranged so as to face the first objects, the method comprising:

(a) photographing the first objects through first photographing means to obtain first photographed images;

(b) forming first virtual data images
corresponding to the first objects in a first image
data area on a monitor screen of a display device on
the basis of the first photographed images and design
5 data of the first objects,

the first virtual data images being
colored and the color denoting either of a
color having a uniform density and a color
having a distributed density;

10 (c) photographing the second objects through
second photographing means to obtain second
photographed images;

(d) forming second virtual data images
corresponding to the second objects in a second image
15 data area on the monitor screen of the display device
on the basis of the photographed images of the second
objects,

the second virtual data images being
colored and the color denoting either of a
20 color having a distributed density and a color
having a uniform density;

(e) relatively moving the first virtual data
images and the second virtual data images on the
monitor screen to superimpose both the virtual data
25 images on each other and then measuring the luminance
of each superimposing portion; and

(f) detecting a superimposing state of the first

09986287 110301

virtual data images and the second virtual data images on the basis of the luminance value measured in the (e).

13. The method according to claim 12, wherein the first objects are a plurality of reference marks
5 arranged in predetermined positions on a substrate and the second objects are a plurality of contact formed on a probe card.

14. An apparatus for moving a main chuck on which first objects are set in X, Y, Z, and θ
10 directions to align the first objects with second objects arranged above the first objects, the apparatus comprising:

second photographing means for photographing the second objects to obtain second photographed images;

15 means for displaying second virtual data images in a second image data area on a monitor screen of a display device on the basis of the second photographed images of the second objects;

means for allowing an optical axis of the second photographing means to match an optical axis of first movable photographing means to obtain a reference
20 position of the main chuck;

means for moving the main chuck to align the first objects with the first photographing means and
25 then allowing the first photographing means to photograph the first objects to obtain first photographed images;

09986287 "11004

means for displaying first virtual data images of the first photographed images in a first image data area on the monitor screen of the display device on the basis of design data of the first objects;

5 means for relatively moving the first virtual data images and second virtual data images on the monitor screen to superimpose both the virtual data images on each other; and

10 means for determining a position where both the virtual data images are most fitly superimposed on each other as an alignment position of the first and second objects.

15 15. The apparatus according to claim 14, wherein the second photographing means is provided for the main chuck.

20 16. The apparatus according to claim 14, wherein the first objects are a plurality of electrode pads formed on an object to be inspected and the second objects are a plurality of contacts to be electrically brought into contact with the electrode pads.

17. The apparatus according to claim 16, wherein the second virtual data images are displayed with a color having a uniform density,

25 the electrode pads photographed by the first photographing means are reference electrodes for alignment among the electrode pads formed on the object to be inspected,

09986627.110303

the first virtual data images of the electrode pads are displayed with dark and light colors, and

the superimposing means determines a position where an image density is most changed due to the superimposition of the first virtual data images and the second virtual data images as a position where both the virtual data images are superimposed on each other so that both the images are most fitly superimposed on each other.

18. An apparatus for aligning a plurality of electrode pads arranged on an object to be inspected with a plurality of contactors formed on a probe card, the apparatus comprising:

first photographing means for photographing predetermined electrode pads among the electrode pads to obtain first photographed images;

means for displaying first virtual data images corresponding to the predetermined electrode pads in a first image data area on a monitor screen of a display device on the basis of the first photographed images and design data of the predetermined electrode pads,

the first virtual data images being colored and the color denoting either of a color having a uniform density and a color having a distributed density;

second photographing means for photographing the contactors to obtain second photographed images;

0546267-10004

means for displaying second virtual data images of the contactors corresponding to the second photographed images in a second image data area on the monitor screen of the display device,

5 the second virtual data images being colored and the color denoting either of a color having a distributed density and a color having a uniform density;

10 means for relatively moving the first virtual data images and the second virtual data images on the monitor screen to superimpose both the virtual data images on each other and then measuring the luminance of a portion where both the virtual data images are superimposed on each other;

15 means for detecting a superimposing state of the first virtual data images and the second virtual data images on the basis of the measured luminance;

20 means for detecting a distance relatively traveled by both the virtual data images until the superimposition of the first virtual data images and the second virtual data images is set to a predetermined state by the means for detecting the superimposing state; and

25 means for relatively moving the electrode pads and the contactors on the basis of the traveled distance to align the pads with the contactors.

19. The apparatus according to claim 18, wherein

09986287-110801

20. The apparatus according to claim 18, wherein
the means for detecting the superimposing state detects
the superimposing state on the basis of a comparison of
the measured luminance with a predetermined luminance
value.

15 22. The apparatus according to claim 18, wherein
each second virtual data image formed in the second
image data area through the displaying means is one of
an image obtained by enlarging a photographed image of
each contactor and an image obtained by reducing the
20 photographed image.

25 the contactors photographed by the second
photographing means are the contactors corresponding to
all of the electrode pads.

25. An apparatus for detecting a superimposing
state of first objects and second objects arranged so
as to face the first objects, the apparatus comprising:

10 means for forming first virtual data images
corresponding to the first objects in a first image
data area on a monitor screen of a display device on
the basis of the first photographed images and design
data of the first objects,

second photographing means for photographing the
20 second objects to obtain second photographed images;

the second virtual data images being colored and the color denoting either of a

means for relatively moving the first virtual data
images and the second virtual data images on the
5 monitor screen to superimpose both the virtual data
images on each other and then measuring the luminance
of each superimposing portion; and

26. The apparatus according to claim 25, wherein the first objects are a plurality of reference marks arranged in predetermined positions on a substrate and the second objects are a plurality of contacts formed on a probe card.

first photographing means for photographing the
first object;

25 first image forming means for forming image data
of the first object on the basis of data obtained by
the first photographing means;

dark and light portions applying means for
5 applying dark and light portions to the image data
formed by the first and second image forming means;

luminance detecting means for detecting at least one of a position having the lowest luminance and a position having the highest luminance on the basis of the luminance of the images superimposed by the superimposing means; and

28. The apparatus according to claim 27, wherein the first object is a wafer, first images are a plurality of electrode pads formed on the wafer, and the second objects are a plurality of probes to be come into contact with the electrode pads.

29. A method for moving a main chuck on which a first object is set in X, Y, Z, and θ directions to

align the first object with second objects arranged above the first object, the method comprising:

(a) photographing the first object;

(b) photographing the second objects;

5 (c) forming image data of the first object on the basis of photographing data of the photographed first object;

10 (d) forming image data of the second objects on the basis of photographing data of the photographed second objects;

(e) applying dark and light portions to images of the first and second image data;

15 (f) relatively moving the image data of the first object and the image data of the second objects, to which the dark and light portions are applied, to superimpose both images on each other;

20 (g) detecting at least one of a position having the lowest luminance and a position having the highest luminance on the basis of the luminance of the superimposed images; and

(h) moving the first object and the second objects on the basis of the detected luminance value to align both the objects with each other.

25 30. The method according to claim 29, wherein the first object is a wafer, the first images are a plurality of electrode pads formed on the wafer, and the second objects are a plurality of probes to be come

09982287 110804

into contact with the electrode pads.

09986287 110801